

# Gironde estuary, France: important autumn stopover site for Aquatic Warbler

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The Afro-Palearctic migrant Aquatic Warbler *Acrocephalus paludicola* has been known as an abundant breeding bird in eastern Europe until the 20th century, after which it began to decrease in a number of countries due to several threats (essentially anthropogenic) changing the ecological functioning of its key sites (de By 1990, Flade & Lachmann 2008, Tanneberger et al 2008).

The drastic decrease of the global population in the last decades has led to a growing awareness of its status and of the importance to develop strategies for the conservation of the species. Hence, Aquatic Warbler was classified as 'threatened' in the IUCN Red List, before becoming 'vulnerable' in 1994 and attributed to the SPEC 1 category, ie, in the category of 'species of global conservation concern' (BirdLife International 2004). Those statuses make the species the most threatened migratory songbird in Europe. In this context, the Aquatic Warbler Conservation Team (AWCT) has been founded in Germany in 1998, under the auspice of BirdLife International, co-ordinating, implementing, gathering data and making available all studies and information about the species. Moreover, an international Memorandum of Understanding (MoU) concerning Conservation Measures for Aquatic Warbler has been concluded in 2003 under the auspice of the Bonn convention (Convention on Migratory Species 2003). It constituted a collective working basis for all the signatory countries, currently 16 (Convention on Migratory Species 2012). In 2008, an International Species Action Plan for Aquatic Warbler was attached to the MoU. It was commissioned by the European Commission and prepared by BirdLife International (Flade & Lachmann 2008). This plan summarized the knowledge on Aquatic Warbler and fixed targets about the global population such as its stabilization and in the longer term, its increase. As Aquatic Warbler is a trans-Saharan migrant, its conservation involves all countries that at any time host the species during breeding, migration and wintering periods. Thus, on the base of studies performed to identify wintering grounds (Schäffer et al 2006) and migration routes (Julliard et al 2006),

the signatories of the MoU and the International Species Action Plan have set up studies in all 22 range states to improve the conservation status of Aquatic Warbler (Convention on Migratory Species 2010).

## Breeding population size

The current breeding population of Aquatic Warbler is estimated at 11 000-16 000 singing males, corresponding with 22 000-32 000 adult individuals or 33 000-48 000 adults and juveniles (BirdLife International 2012). Seven countries hold breeders (Belarus, Germany, Hungary, Lithuania, Poland, Ukraine and, irregularly, Russia) in less than 40 sites together covering only c 1000 km<sup>2</sup>. Moreover, almost 80% of the global population is concentrated in only four sites, essentially in Belarus, Poland and Ukraine (Flade & Lachmann 2008). Four biogeographic populations are known but two of them are likely to disappear within a short period of time because of their very small size and their high geographic and/or genetic isolation: the genetically isolated Pomeranian population (north-western Polish and German population of c 80 males) and the western Siberian (Russian) population, isolated from the core population by c 4000 km (Flade & Lachmann 2008, Gießing 2002). Aquatic Warbler is an extreme habitat specialist. It occurs in open wetlands, like fen mires, characterized by mesotrophic to poor eutrophic level, without any shrub and too much reed vegetation (Kozulin & Flade 1999, Kovács & Végvari 1999, Kloskowski & Krogulec 1999, Tanneberger et al 2008, 2010).

## Movements

### *Post-breeding migration*

The departure from the breeding grounds for the wintering areas starts in the last week of June for males (which do not take part in the care of juveniles; Dyrce et al 2011), first brood juveniles and some adult females not making a second clutch (de By 1990). If the weather permits, second clutches may be started until early July. The major-



**30** Aquatic Warbler / Waterrietzanger *Acrocephalus paludicola*, adult, Gironde estuary, Charente-Maritime, France, 23 August 2011 (Raphaël Musseau) **31** Aquatic Warbler / Waterrietzanger *Acrocephalus paludicola*, adult, Gironde estuary, Charente-Maritime, France, 15 August 2012 (Raphaël Musseau) **32** Aquatic Warbler / Waterrietzanger *Acrocephalus paludicola*, juvenile, Gironde estuary, Charente-Maritime, France, 22 August 2011 (Raphaël Musseau) **33** Aquatic Warbler / Waterrietzanger *Acrocephalus paludicola*, juvenile, Gironde estuary, Charente-Maritime, France, 22 August 2012 (Raphaël Musseau)

ity of males leave in the second half of July (de By 1990). Birds take a western migratory route mainly along the coastlines to reach north-western Africa in September, western Africa in October and the sub-Saharan winter quarters in November (Flade & Lachmann 2008, Schäffer et al 2006). During post-breeding migration, the species is regularly recorded in Latvia, Lithuania, Poland, Germany, Netherlands, Belgium, France, Portugal, Spain and sometimes in England (Flade & Lachmann 2008). Indirect records (predated individuals discovered in nests of Eleonora's Falcon *Falco eleonora*) have also been documented along the Mediterranean Sea and Black Sea, in Turkey and Bulgaria (Flade & Lachmann 2008). Habitats used are close to those

used in the breeding areas: wetlands with low vegetation composed of *Scirpus*, *Juncus* and/or low reeds (Miguélez et al 2009, Kerbiriou et al 2010, Provost et al 2010). This is also the case for the few birds using a more interior route, through inland wetlands in the Iberian Peninsula (Miguélez et al 2009). Recently, Salewski et al (2012) published results of research in which 30 geolocators were attached to breeding birds of the Supii marshes, central Ukraine, in 2010. Three geolocators with useful data on autumn migration were recovered in 2011. They revealed a previously unknown migration route via south-eastern and southern Europe west to south-western France (including the Gironde estuary) and Spain.

### *Wintering areas*

In Africa, the species has been recorded in nine countries but, since 1980, records are registered from only five countries (Egypt, Ghana, Mauritania, Morocco and Senegal; Schäffer et al 2006). Currently, only two sites are known to be important wintering areas. The first one was discovered around Djoudj National Park, Senegal, in 2007 (Salewski et al 2009), the second one in the Inner Niger Delta, Mali, in 2001 (Poluda et al 2012). Birds use the same habitats as on their breeding grounds (Salewski 2012). They stay from November to March and they begin their spring migration by flying north to the northern Sahel zone in Mauritania (Schäffer et al 2006). Salewski et al (2012) reported a bird fitted with a geolocator in central Ukraine in 2010 which, in winter 2010/11, spent some time well south of the currently known non-breeding areas in western Africa.

### *Spring migration*

Spring migration is not well known. Some records from eastern Spain, southern France, northern Italy, Switzerland and south-western Germany suggest that the birds take a more direct and Mediterranean route (rounding the Mediterranean sea via the west or the east or crossing it), still using the same type of habitats (Atienza et al 2001, Poulin et al 2010, Aquatic Warbler Conservation Team 2012, Poluda et al 2012).

### **Importance of studying stopover ecology for global conservation**

Given that migratory birds spend a quarter of the year on migration (Zduniak & Yosef 2012) and that their survival outside the breeding season has an impact on the number of breeders (Newton 2006), it is worth worrying about the quality of stopover sites. Birds spend more time in these areas than in active migration flight (Zduniak & Yosef 2012) and in these areas they find an opportunity to rest, to wait for better weather conditions to continue migration and to replenish their energy reserves by accumulating fat (Sutherland 1998). Thus, it is crucial to identify migratory stopover sites, the extent of their role and the possibilities to manage landscapes in favour of the species (Sutherland 1998, Chernetsov 2006).

### **Monitoring scheme developed at Gironde estuary and first results**

Probably because France is part of the western limit of continental Europe, birds are concentrated in large numbers along the Atlantic coastline, making this country the European area receiving

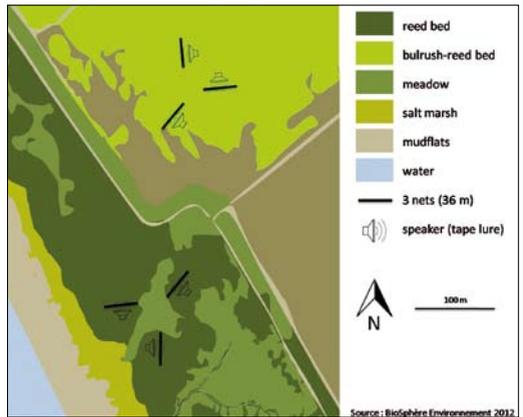
the highest number of Aquatic Warblers during post-breeding migration (Julliard et al 2006, Jiguet et al 2011). As France plays a very important role in the stopover of the species (Julliard et al 2006, Jiguet et al 2011), studies and management measures in this country are essential for the conservation of the species. In Bretagne, an EU-Life programme 'Acrocephalus Bretagne – Conservation of the Aquatic Warbler in Brittany' was set up in 2004 by the NGO Bretagne Vivante. After this first conservation programme, the French government has scheduled a National Action Plan – the French implementation of the International Plan – from 2010 to 2014 (Le Nevé et al 2009).

The Gironde estuary, Charente-Maritime, region Poitou-Charentes, is one of the best French sites regarding the number of Aquatic Warblers captured during post-breeding migration (Le Nevé et al 2009). Hence, to be able to characterize the stopover ecology of Aquatic Warbler in this area, it is important to know its ecological requirements, ie, which habitats are chosen, how are they used and for how long? The following paragraphs present methods and some results of several studies that have been implemented at the Gironde estuary.

### *Study sites and methods*

After several years of trapping Aquatic Warblers during post-breeding migration at the Gironde estuary, we decided, in 2009, to develop a focused study on this species with a highly standardized trapping protocol during August. The work started with a trapping strategy developed on two sites, c 3 km apart, owned by Conservatoire du Littoral and managed by Conservatoire Regional d'Espaces Naturels de Poitou-Charentes. The first was a reed bed along Chenac-Saint-Seurin-d'Uzet harbour (45°30'08"N, 0°50'26"W, site 1; plate 34), and the second a reed bed near the Conchemarthe laguna, along Mortagne-sur-Gironde harbour (former agricultural polder subject to tidal influence since a dam break during winter 1999-2000; 45°28'44"N, 0°49'06"W, site 2; plate 35). On each site, a 108 m long line composed of nine 12 m mistnets was installed and following the French capture protocol proposed by the French Museum of Natural History (Jiguet et al 2012), an Aquatic Warbler playback was installed at every third net in the line. Nets were opened every morning for five hours, from one hour before sunrise. The playback started 1.5 hour before sunrise and ran during the whole capture session.

First results were rather good: 79 captures in 2009 (23 at site 1 and 56 at site 2) and 60 captures



**34** Reed bed near Chenac-Saint-Seurin-d'Uzet harbour, Gironde estuary, Charente-Maritime, France (site 1), August 2007 (*Raphaël Musseau*) **35** Conchemarche lagoon near Mortagne-sur-Gironde harbour, Gironde estuary, Charente-Maritime, France (site 2), October 2010 (*Conservatoire d'Espaces Naturels de Poitou-Charentes*) **36** Mistnet in bulrush-reed bed, Gironde estuary, Charente-Maritime, France, August 2011 (*Raphaël Musseau*)  
 FIGURE 1 Map showing mistnet arrangement at Conchemarche lagoon, Gironde estuary, Charente-Maritime, France, since 2011

in 2010 (29 at site 1 and 31 at site 2). Despite these encouraging first results, a first analysis showed a low number of recaptured birds, hampering the study of stopover ecology (eg, fattening rate of birds, stopover duration). Therefore, in 2011, we decided to concentrate all capture effort around the Conchemarche lagoon (site 2), which had proved to be the best of both sites for the species. In this area, we developed a trapping strategy in the two main habitats: reed bed (dominated by *Phragmites australis*) and bulrush-reed bed (dominated by *Bolboschoenus maritimus* and low *Phragmites australis*). In each habitat, three lines of three 12 m mistnets (with a playback in the centre of each line) separated by c 45 m were installed

in different orientations (figure 1, plate 36). The protocol (net opening duration and playback starting time) was the same as in 2009-10.

In order to complement the stopover survey, we decided to employ a radio-tracking scheme to study home ranges and habitat choice. This was done during August 2010 and August 2011. During this survey, 20 birds had been tagged with radio-transmitters glued on back feathers.

*Captures distribution: habitats and chronology*  
 For the two years 2011 and 2012, the average number of trapped Aquatic Warblers was 160.5 per year (182 birds in 2011 and 139 in 2012). The 'Acrola index', defined as the percentage of the

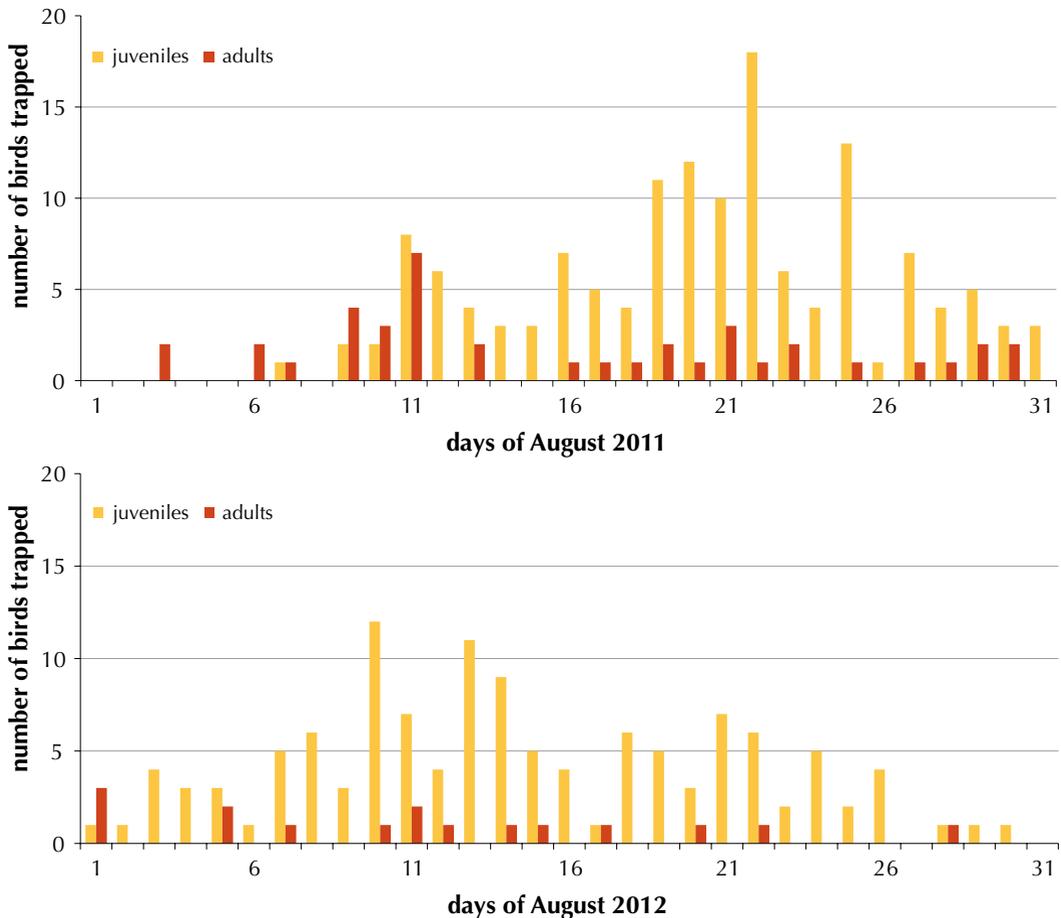


FIGURE 2 Capture chronology of Aquatic Warbler *Acrocephalus paludicola* at Conchemarthe laguna, Gironde estuary, Charente-Maritime, France, in 2011 (above) and 2012 (below)

number of Aquatic Warblers out of the total number of *Acrocephalus* warblers (Julliard et al 2006), was 7.5% (8.5% in 2011 and 6.5% in 2012). This index was much higher in the bulrush-reed bed (13.1%, with 15.1% in 2011 and 11.2% in 2012) than in the reed bed (3.2%, with 3.3% in 2011 and 3.0% in 2012). This habitat comparison was made with intraseasonal recaptures excluding intraday recaptures.

For the cumulated two years, the threshold of 50% of Aquatic Warbler captures (ie, median date) was reached on 18 August (22 August in 2011 and 11 August in 2012). The maximum number of captures was reached on 22 August in 2011 (19 captures in the morning, ie, 10.4% of the captures of the month) and on 10 August in 2012 (13 captures in the morning, ie, 9.3% of the

captures of the month).

Age ratio was highly biased among captures: 82.6% of birds caught were juveniles (78.0% in 2011 and 88.5% in 2012) and the capture chronology showed an earlier passage for adults than for juveniles (figure 2). For the aggregated two years, the median date for juveniles was 19 August, whereas for adults it was 11 August.

#### *Local recaptures and stopover duration*

The number of local recaptures was rather high (average: 10.9% for the aggregated two years, 10.4% in 2011 and 11.5% in 2012). Following the methods by Schaub et al (2001), the evaluation of survival and seniority rates allowed to assess an average stopover duration of c six days.



- 37** Typical habitat used by Aquatic Warbler *Acrocephalus paludicola* during stopover at Gironde estuary, Charente-Maritime, France, August 2011 (*Raphaël Musseau*). Bulrush-reed bed at low tide at Conchemarche laguna.
- 38** Typical habitat used by Aquatic Warbler *Acrocephalus paludicola* during stopover at Gironde estuary, Charente-Maritime, France, August 2010 (*Benoit Laval*). Low wet vegetation around hunting pond along Gironde shore at Mortagne-sur-Gironde.
- 39** Dike restoration works at Conchemarche laguna, Gironde estuary, Charente-Maritime, France, integrating maintaining of favourable water level for low wet vegetation, July 2011 (*Raphaël Musseau*)
- 40** Dike restoration works at Conchemarche laguna, Gironde estuary, Charente-Maritime, France, integrating maintaining of favourable water level for low wet vegetation, October 2011 (*Raphaël Musseau*)

#### Home range and habitats

For two years, 2010 and 2011, 17 individuals out of 20 were successfully radio-tracked and a total of 926 positions were collected. Only data collected on 14 birds allowed determination of home range characteristics. Analyses showed that birds explored areas measuring c 6 ha but in fact exploited restricted areas (core areas) together covering c 1 ha. Analyses of habitat selection/rejection (following Ivlev index, Kenward 1992) achieved with the 926 positions revealed that bulrush-reed bed regularly inundated by tides (in the laguna; plate 37) or with permanent water

(around hunting ponds built along the Gironde shore; plate 38) were the main habitats exploited.

#### Conclusions

The change in the trapping strategy has allowed for an increase in the number of recaptures at the Gironde estuary, strongly improving the possibilities of stopover duration assessment. The results thus obtained (in terms of number of trapped birds and length of time spent on the site) demonstrate the importance of the Gironde estuary for post-breeding migration. Similar trends are observed at Loire estuary (Foucher 2010, Foucher et al 2011)

and Baie de l'Aiguillon (Gonin & Mercier 2011), highlighting the important role of huge estuaries and bays along the Bay of Biscay for Aquatic Warbler stopovers.

Concerning habitat exploitation, the results obtained from the radio-tracking schemes show the importance of low wet vegetation like bulrush-reed bed. This corroborates results obtained in northern France at Seine estuary (Provost et al 2010). Given the possibilities of soil and vegetation dynamics in coastal areas, those results reveal the necessity to expand management plans to maintain low wet grasslands at stopover sites. For instance, at Conchemarche laguna, most of the favourable habitats are subject to a significant siltation and overgrowing with the development of high dense reed beds or dry meadows due to rising soil level. This observation obliges to develop a conservation strategy in order to preserve favourable wetlands for Aquatic Warbler. As a reaction, in 2011, the Conservatoire d'Espaces Naturels de Poitou-Charentes, with the financial support of the Conseil Général de la Charente-Maritime, took advantage of the dike restoration managed in 2011 to lower the soil level in parts of the laguna. This arrangement has been set up on the basis of our results to maintain a favourable water level and to permit low wet vegetation to develop (plate 39-40). More works are planned for the end of 2013 with the digging of ponds and small channels in areas with dry meadows and dense reed bed. Those works will increase the habitat heterogeneity and avoid the disappearance of favourable areas for Aquatic Warbler.

Habitat evolution also appears to be one of the most important issues for Aquatic Warbler conservation on breeding sites (Kloskowski & Krogulec 1999). Management is revealed as very successful since, during spring 2012, the Biebrza National Park in Poland did not record a population decrease while the number of breeders suffered a drastic decline of c one-third in other countries (Aquatic Warbler Conservation Team 2012).

On a larger scale, Aquatic Warbler uses endangered areas throughout its whole range. In Europe, wetlands are used too intensively and in Africa, they are threatened by overgrazing or by the setup of rice fields (Aquatic Warbler Conservation Team 2012). Thus, habitat management all over the Aquatic Warbler range is the key to preserving the species and to counter the drastic population decreases measured since the beginning of the 20th century. We hope that the world economical crisis will not slow down local dynamics that can emerge on key sites. For instance, at the Gironde

estuary, despite the fact that it is one of the most important areas for Aquatic Warbler during post-breeding migration, the National Action Plan has not been implemented due to lack of funding.

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### **Samenvatting**

GIRONDE-ESTUARIIUM, FRANKRIJK: BELANGRIJKE NAJAARSPLEISTERPLAATS VOOR WATERRIETZANGER Veel Waterrietzangers *Acrocephalus paludicola* trekken in het najaar vanuit de overwegend Oost-Europese broedgebieden eerst westwaarts naar West-Europa om vervolgens via de Atlantische kustgebieden en Spanje Afrika te bereiken. Het gebied aan de noordzijde van het Gironde-estuarium, Charente-Maritime, regio Poitou-Charentes, Frankrijk, herbergt vanouds belangrijke aantallen Waterrietzangers tijdens de najaarstrek. Om habitatkeuze en verblijfsduur beter in beeld te krijgen, werd in 2009-10 een eerste poging gedaan om gericht Waterrietzangers te vangen op twee locaties langs de Gironde. Er werden in deze twee jaren respectievelijk 79 en 60 vogels gevangen. Het aantal terugvangsten was echter beperkt en de vangstinspanning werd in 2011-12 geheel geconcentreerd op de beste van de twee locaties, de Conchemarche lagune nabij Mortagne-sur-Gironde, met iets aangepaste mistnetopstellingen en lokgeluid in twee habitattypen (rietveld gedomineerd door Riet *Phragmites australis* en zeebies-rietveld gedomineerd door Heen (of Zeebies) *Bolboschoenus maritimus* en laag riet).

In 2011-12 werden respectievelijk 182 en 139 Waterrietzangers gevangen, waarbij met name in mistnetten in de zeebies-rietvelden de verhouding Waterrietzanger vs andere *Acrocephalus*-zangers hoog was. De mediane vangstdatum (50% van het seizoenstotaal gevangen) was 22 augustus in 2011 (met maximum van 19 op 22 augustus) en 11 augustus in 2012 (met maximum van 13 op 10 augustus). Het percentage eerstejaarsvogels in beide jaren was respectievelijk 78.0% en 88.5%. De

mediane datum (over beide jaren) voor eerstejaars was 19 augustus, voor adulte 11 augustus. Analyse van de terugvangsten leverde een gemiddelde verblijfsduur van zes dagen op. Een aantal Waterrietzangers kon worden voorzien van radiotransmitters. Hieruit bleek dat ze een gebied van tot 6 ha konden bestrijken, maar dat de meeste in een beperkter gebied van c 1 ha verbleven.

Veel van de typen gebieden waarin Waterrietzangers tijdens de trek pleisteren worden bedreigd doordat de bodem ophoogt en minder nat wordt en de daarmee samenhangende verdere ontwikkeling van de vegetatie. Er zijn verschillende beheerplannen opgesteld om tot verbetering van dergelijke gebieden te komen maar op sommige plekken zijn die door geldgebrek (vooralsnog) niet uitgevoerd.

## References

- Aquatic Warbler Conservation Team 2012. Website: [www.aquaticwarbler.net/taw/index.html](http://www.aquaticwarbler.net/taw/index.html).
- Atienza, J C, Pinilla, J & Justribo, J H 2001. Migration and conservation of the Aquatic Warbler *Acrocephalus paludicola* in Spain. *Ardeola* 48:197-208.
- BirdLife International 2004. Birds in the European Union: a status assessment. Wageningen.
- BirdLife International 2012. Species factsheet: *Acrocephalus paludicola*. Website: [www.birdlife.org](http://www.birdlife.org). [Accessed 19 September 2012.]
- de By, R A 1990. Migration of Aquatic Warbler in western Europe. *Dutch Birding* 12: 165-181.
- Chernetsov, N 2006. Habitat selection by nocturnal passerine migrants en route: mechanisms and results. *J Ornithol* 146:185-191.
- Convention on Migratory Species 2003. The Memorandum of Understanding (MoU) concerning conservation measures for the Aquatic Warbler. Minsk.
- Convention on Migratory Species 2010. Amending protocol of the Memorandum of Understanding (MoU) concerning conservation measures for the Aquatic Warbler. Second meeting of the signatories, Biebrza National Park, Poland.
- Convention on Migratory Species 2012. Summary sheet of the Memorandum of Understanding concerning Conservation Measures for the Aquatic Warbler. Website: [www.cms.int/pdf/en/summary\\_sheets/warb.pdf](http://www.cms.int/pdf/en/summary_sheets/warb.pdf).
- Dyrz, A, Zdunek, W & Schulze-Hagen, K 2011. Increased male singing in response to predator presence may represent reproductive investment in a promiscuous species, the Aquatic Warbler *Acrocephalus paludicola*. *Acta Ornithol* 46: 97-100.
- Flade, M & Lachmann, L 2008. International Species Action Plan for the Aquatic Warbler *Acrocephalus paludicola*. Website: [http://ec.europa.eu/environment/nature/conservation/wildbirds\\_plans/docs/acrocephalus\\_paludicola.pdf](http://ec.europa.eu/environment/nature/conservation/wildbirds_plans/docs/acrocephalus_paludicola.pdf). [Accessed 10 January 2013.]
- Foucher, J 2010. Bilan et analyse des données du camp de baguage de Donges Est 2010. ACROLA.
- Foucher, J, Dugué, H, Ozarowska, A, Wojczulanis-Jakubas, K, Heinrich, F, Lefebvre, M, & Archer, E 2011. Bilan et analyse des données de la station de baguage de Donges Est pour l'année 2011. ACROLA.
- Gießing, B 2002. Viele Väter für eine Brut-vorteilhaft oder unausweichlich für das Weibchen? Zum Paarungssystem und zur Populationsgenetik des Seggenrohrsängers (*Acrocephalus paludicola*). Köln.
- Gonin, J & Mercier, F 2011. Evaluation des potentialités d'accueil des prés salés de la Baie de l'Aiguillon pour la halte migratoire postnuptiale du Phragmite aquatique *Acrocephalus paludicola*. LPO Charente-Maritime.
- Jiguet, F, Chiron, F, Dehorter, O, Dugué, H, Provost, P, Musseau, R, Guyot, G, Latraube, F, Fontanilles, P, Séchet, E, Laignel, J, Gruwier, X & Le Nevé, A 2011. How many Aquatic Warblers *Acrocephalus paludicola* stop over in France during the autumn migration? *Acta Ornithol* 46: 135-142.
- Jiguet, F, Dehorter, O, Gonin, J, Latraube, F, Le Nevé, A & Provost, P 2012. Connaissance de la migration du Phragmite aquatique en France: méthodologie de suivi scientifique et réglementation; version de juillet 2012. CRBPO, Bretagne Vivante.
- Julliard, R, Bargain, B, Dubos, B & Jiguet, F 2006. Identifying autumn migration routes for the globally threatened Aquatic Warbler *Acrocephalus paludicola*. *Ibis* 148: 735-743.
- Kenward, R E 1992. Quantity versus quality: programmed collection and analysis of radio-tracking data. In: Priege, I G & Swift, S M (editors), *Wildlife telemetry, remote monitoring and tracking of animals*. Chichester, pp 231-246.
- Kerbiriou, C, Bargain, B, Le Viol, I & Pavoine, S 2010. Diet and fuelling of the globally threatened aquatic warbler at autumn migration stopover as compared with two congeners. *Anim Conserv* 14: 261-270.
- Kloskowski, J & Krogulec, J 1999. Habitat selection of Aquatic Warbler *Acrocephalus paludicola* in Poland: Consequences for conservation of the breeding areas. *Vogelwelt* 120: 113-120.
- Kovács, G & Végvari, Z 1999. Population size and habitat of the Aquatic Warbler *Acrocephalus paludicola* in Hungary. *Vogelwelt* 120: 121-125.
- Kozulin, A & Flade, M 1999. Breeding habitat, abundance and conservation status of the Aquatic Warbler *Acrocephalus paludicola* in Belarus. *Vogelwelt* 120: 97-111.
- Le Nevé, A, Provost, P, Latraube, F & Bargain, B 2009. Le Phragmite aquatique *Acrocephalus paludicola*; Plan national d'action 2010-2014. Ministère de l'Écologie, de l'Énergie, du Développement durable et de l'Aménagement du Territoire, Direction régionale de l'environnement Bretagne, Bretagne Vivante – SEPNB.
- Miguélez, D, Zumalacarreigui, C, Fuertes, B, Astiarraga, H, Gonzalez-Janez, R, Isabel, R & De la Calzada, F 2009. Habitat, phenology and biometrics of the Aquatic Warbler *Acrocephalus paludicola* during autumn migration through a riverine wetland in Iberia. *Ring and Migration* 24: 277-279.
- Newton, I 2006. Can conditions experienced during migration limit the population levels of birds? *J Ornithol* 147: 146-166.

- Poluda, A, Flade, M, Foucher, J, Kiljan, G, Tegetmeyer, C & Salewski, V. 2012. First confirmed connectivity between breeding sites and wintering areas of the globally threatened Aquatic Warbler *Acrocephalus paludicola*. *Ring and Migration* 27: 57-59.
- Poulin, B, Duborper, E & Lefebvre, G 2010. Spring stopover of the globally threatened Aquatic Warbler *Acrocephalus paludicola* in Mediterranean France. *Ardeola* 57: 167-173.
- Provost, P, Kerbiriou, C & Jiguet, F 2010. Foraging range and habitat use by Aquatic Warblers *Acrocephalus paludicola* during a fall migration stopover. *Acta Ornithol* 45: 173-180.
- Salewski, V 2012. First photographs of Aquatic Warbler *Acrocephalus paludicola* in the field from Africa and a request for observations. *Bull Afr Bird Club* 19: 217-220.
- Salewski, V, Bargain, B, Diop, I & Flade, M 2009. Quest for a phantom - the search for the winter quarters of the Aquatic Warbler *Acrocephalus paludicola*. *Bull Afr Bird Club* 16: 61-66.
- Salewski, V, Flade, M, Poluda, A, Kiljan, G, Liechti, F, Lisovski, S & Hahn, S 2012. An unknown migration route of the 'globally threatened' Aquatic Warbler revealed by geolocators. *J Ornithol* in press.
- Schäffer, N, Walthers, B A, Gutteridge, K & Rahbek, C 2006. The African migration and wintering grounds of the Aquatic Warbler *Acrocephalus paludicola*. *Bird Conserv Intern* 16: 33-56.
- Schaub, M, Pradel, R, Jenni, L & Lebreton, J-D 2001. Migrating birds stop over longer than usually thought: an improved capture-recapture analysis. *Ecology* 82: 852-859.
- Sutherland, W J 1998. The importance of behavioural studies in conservation biology. *Anim Behav* 56: 801-809.
- Tanneberger, F, Bellabaum, J, Fartmann, T, Haferlan, H-J, Helmecke, A, Jehle, P, Just, P & Sadlik, J 2008. Rapid deterioration of Aquatic Warbler *Acrocephalus paludicola* habits at the western margin of the breeding range. *J Ornithol* 149:105-115.
- Tanneberger, F, Flade, M, Preiksa, Z & Schröder, B 2010. Habitat selection of the globally threatened Aquatic Warbler *Acrocephalus paludicola* at the western margin of its breeding range and implications for management. *Ibis* 152: 347-358.
- Zduniak, P & Yosef, R 2012. Crossing the desert barrier: Migration ecology of the Lesser Whitethroat (*Sylvia curruca*) at Eilat, Israel. *J Arid Environments* 77: 32-38.

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